

AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS

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Claim 1. (Currently Amended) A three-dimensional image capturing device, comprising:
a light source that radiates a distance measuring light beam irradiating a measurement subject, ~~said~~ the measurement subject reflecting ~~said~~ the distance measuring light beam to generate a reflected light beam;

a plurality of first photoelectric conversion elements and a plurality of second photoelectric conversion elements, arranged in a predetermined direction, that receive ~~said~~ the reflected light beam, ~~so that electric charge corresponding to an amount of said received reflected light beam is accumulated in each of said first and second photoelectric conversion elements~~ accumulating electric charge corresponding to an amount of the received reflected light beam;

a first electric charge holding unit disposed adjacent to each of said first photoelectric conversion elements;

a second electric charge holding unit disposed adjacent to each of said second photoelectric conversion elements;

a first electric charge transfer processor that transfers a first electric charge accumulated in said first photoelectric conversion elements to said first electric charge holding unit with first electrodes connected only to said first electric charge holding unit;

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a second electric charge transfer processor that transfers a second electric charge accumulated in said second photoelectric conversion elements to said second electric charge holding unit with second electrodes connected only to said second electric charge holding unit; and

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an electric charge integrating processor that drives said first electric charge transfer processor repeatedly, so that ~~said~~ the first electric charge, relating to distance information of ~~said~~ the measurement subject, is integrated in said first electric charge holding unit.

Claim 2. (Currently Amended) A device according to claim 1, further comprising:

a first electric charge discharging processor that discharges unwanted charge accumulated in each of said first photoelectric conversion elements, so that an accumulating operation of electric charge is started in each of said first photoelectric conversion elements; and

a second electric charge discharging processor that discharges unwanted charge accumulated in each of said second photoelectric conversion elements, so that an accumulating operation of electric charge is started in each of said second photoelectric conversion elements; and

wherein said electric charge integrating processor is operated by alternately driving said first electric charge discharging processor and said first electric charge transfer processor alternately.

Claim 3. (Currently Amended) A device according to claim 2, wherein said first photoelectric conversion elements and said second photoelectric conversion elements are formed on a substrate, and said first electric charge discharging processor discharges ~~said~~ the unwanted charge to said substrate.

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Claim 4. (Currently Amended) A device according to claim 1, wherein said first and second electric charge holding units are provided in a vertical transfer unit that outputs ~~said the~~ electric charge from ~~said the~~ three-dimensional image capturing device.

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Claim 5. (Original) A device according to claim 1, wherein said first photoelectric conversion elements are arranged in a predetermined direction with a predetermined number of said second photoelectric conversion elements ~~in~~ between said first photoelectric conversion elements.

Claim 6. (Currently Amended) A device according to claim 2, wherein said first electric charge discharging processor outputs an electric charge discharging signal to discharge ~~said the~~ unwanted charge, and said first electric charge holding processor outputs a first electric charge transfer signal to transfer ~~said the~~ first electric charge to said first electric charge holding unit, and said second electric charge holding processor outputs a second electric charge transfer signal to transfer ~~said the~~ second electric charge to said second electric charge holding unit, ~~said the~~ electric charge discharging signal and ~~said the~~ first and second electric charge transfer signals being pulse signals.

Claim 7. (Currently Amended) A device according to claim 6, wherein ~~said the~~ first electric charge, corresponding to at least distance information of ~~said the~~ measurement subject, accumulates in said first photoelectric conversion elements until ~~a receiving of said reflected light beam by said~~ first photoelectric conversion elements ~~ends~~ stops receiving the reflected light beam.

Claim 8. (Currently Amended) A device according to claim 7, wherein ~~said the~~ first electric charge, corresponding to at least distance information of ~~said the~~ measurement subject, starts to

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accumulate in said first photoelectric conversion elements when ~~an output of said~~ the electric charge discharging signal ends.

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Claim 9. (Currently Amended) A device according to claim 6, wherein said light source radiates a pulsed beam of ~~said~~ the distance measuring light beam during a first accumulating period, which is extends from an output of said electric charge discharging signal to an output of said first electric charge transfer signal, and ~~said~~ the first electric charge corresponding to distance information regarding ~~said~~ the measurement subject is integrated in said first electric charge holding unit.

Claim 10. (Currently Amended) A device according to claim 2, further comprising:
a radiating operation control processor that prohibits ~~a radiation of said~~ light source from radiating the distance measuring light beam ~~from being radiated from said light source~~; and
an image information sensing processor that drives said first and second electric charge discharging processors and said first and second electric charge transfer processors, ~~on condition that~~ said radiation of said distance measuring light beam prohibited by when said radiating operation control processor prohibits said light source from radiating the distance measuring light, so that said first and second electric charge corresponding to an image information of ~~said~~ the measurement subject is transferred to said first and second electric charge holding units, respectively.

Claim 11. A three-dimensional image capturing device, comprising:
a light source that radiates light irradiating a measurement subject;
a plurality of optical sensors that generate electric charge corresponding to an amount of light received by said optical sensors ~~and is,~~ the optical sensors being separated into predetermined groups;

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a plurality of electric charge transfer electrodes ~~that are~~ applied to each of said optical sensors ~~in order to transport said output the~~ electric charge generated in said optical sensors ~~to the outside of said optical sensors, groups of the electric charge transfer electrodes corresponding to the~~ predetermined groups of optical sensors;

an electric charge transfer unit that holds ~~said the~~ electric charge ~~transferred output~~ from said optical sensors by said electric charge transfer electrodes and ~~transports said~~ transfers the electric charge held in said electric charge transfer unit;

an electric charge transfer electrode control processor that ~~can control~~ independently controls each ~~said group of the groups~~ of said electric charge transfer electrodes ~~independently;~~ and

an electric charge accumulating processor that repeatedly drives said electric charge transfer electrode control processor and repeatedly transfers electric charge generated in ~~certain at least one~~ of said predetermined groups of said optical sensors, so that ~~the~~ transferred electric charge accumulates in said electric charge transfer unit.

Claim 12. (Currently Amended) A three-dimensional image capturing device, comprising:

a light source that radiates a distance measuring light beam irradiating a measurement subject, ~~said the~~ measurement subject reflecting ~~said the~~ distance measuring light beam to generate a reflected light beam;

a plurality of photoelectric conversion elements, configured in a matrix arrangement, that receive ~~said the~~ reflected light beam, ~~so that electric charge corresponding to an amount of said received reflected light beam is accumulated in each of~~ said photoelectric conversion elements

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accumulating electric charge corresponding to at least distance information based on an amount of the received reflected light beam, and is disposed in a matrix arrangement;

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a vertical transfer unit that is disposed along each vertical line of said photoelectric conversion elements, ~~so that said electric charge accumulated in said photoelectric conversion elements is transferred~~ transferring the accumulated electric charge in a vertical direction;

a horizontal transfer unit that is disposed ~~nearby~~ near one end of said vertical transfer unit and in parallel with horizontal lines of said photoelectric conversion elements, so that ~~said the~~ electric charge is transferred in a horizontal direction;

a an electric charge transfer processor that transfers electric charge accumulated only in photoelectric conversion elements comprising effective horizontal lines, which are disposed every predetermined number of ~~said the~~ horizontal lines;

a an electric charge integrating processor that drives said electric charge transfer processor repeatedly and integrates ~~said the~~ electric charge accumulated in said photoelectric conversion elements comprising ~~said the~~ effective horizontal lines[[,]] in said vertical transfer unit; and

a transfer operation control processor that controls said horizontal transfer unit and said vertical transfer unit, so that said horizontal transfer unit is driven only when ~~said the~~ electric charge corresponding to ~~said the~~ effective horizontal lines is transferred to said horizontal transfer unit.

Claim 13. (Currently Amended) A device according to claim 12, wherein ~~said the~~ horizontal lines are separated into a plurality of groups and ~~said the~~ effective horizontal lines ~~are composed of~~ comprise at least one of said the groups or combination of said groups.

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Claim 14. (Currently Amended) A device according to claim 13, wherein ~~said the~~ horizontal lines are separated into first, second and third groups, ~~and an arrangement of said first, second and third groups which are arranged in a vertical direction is a repetition of a~~ “such that an order of first group, second group, second group, third group, second group, second group” ~~order is repeated.~~

Claim 15. (Currently Amended) A device according to claim 12, further comprising an electric charge discharging processor that starts ~~accumulation of said~~ accumulating the electric charge in said photoelectric conversion elements by discharging unwanted charge accumulated in said photoelectric conversion elements, ~~and;~~

wherein said electric charge integrating processor is operated by driving said electric charge discharging processor and said electric charge transfer processor ~~alternatively~~ alternately.

Claim 16. (Currently Amended) A device according to claim 15, wherein said photoelectric conversion elements are formed on a substrate, and said electric charge discharging processor discharges ~~said the~~ unwanted charge to said substrate.

Claim 17. (Currently Amended) A device according to claim 16, wherein ~~accumulation of said photoelectric conversion elements begin accumulating the~~ electric charge corresponding to at least distance information of ~~said the~~ measurement subject ~~starts in said photoelectric conversion elements~~ when an output of an electric discharging signal, which discharges ~~said the~~ unwanted charge in said electric charge discharging processor, ends.

Claim 18. (Currently Amended) A device according to claim 17, wherein said light source radiates a pulsed beam of said distance measuring light beam during a first accumulating period, which is from an output of said electric charge discharging signal to an output of said electric charge

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transfer signal, and said electric charge corresponding to distance information regarding said measurement subject is integrated in said vertical transfer unit of said effective horizontal lines.

Claim 19. (Currently Amended) A three-dimensional image capturing device, comprising:

a light source that ~~radiates light irradiating~~ irradiates a measurement subject;

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a plurality of photoelectric conversion elements, arranged in a matrix, that ~~can receive an~~ amount of light reflected from the measurement subject and that accumulate electric charge corresponding to an the received amount of light received by said photoelectric conversion elements, and disposed in a matrix arrangement, said photoelectric conversion elements comprising first photoelectric conversion elements and second photoelectric conversion elements, a number of said second photoelectric conversion elements being less than a number of said first photoelectric conversion elements;

a an electric charge transfer control processor that controls an electric transfer operation, which outputs the electric charge accumulated in said photoelectric conversion elements ~~to the outside of said photoelectric conversion elements;~~

a distance calculating processor that calculates a distance, ~~from said photoelectric conversion element to said~~ the measurement subject, from an based on the amount of electric charge accumulated in said photoelectric conversion elements from light reflected by said measurement subject and received in said photoelectric conversion elements;

a first distance measuring processor that drives said electric charge transfer control processor ~~in order~~ to output the electric charge accumulated in all said photoelectric conversion elements, and

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calculates ~~distances~~ the distance corresponding to all said photoelectric conversion elements by ~~means of using~~ said distance calculating processor; and

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a second distance measuring processor that drives said electric charge transfer control processor in order to output the electric charge accumulated in selected photoelectric conversion elements of the plurality of photoelectric conversion elements, and calculates ~~distances~~ the distance corresponding to said selected photoelectric conversion elements ~~by means of using~~ said distance calculating processor; and

a distance measurement selecting processor that selects one of said first distance measuring processor and said second distance measuring processor, and drives the selected processor;

wherein said second distance measuring processor comprises:

a first high speed mode that drives said electric charge transfer control processor to output electric charge from said first photoelectric conversion elements, and that calculates the distance corresponding to said first photoelectric conversion elements; and

a second high speed mode that drives said electric charge transfer control processor to output electric charge from said second photoelectric conversion elements, and that calculates the distance corresponding to said second photoelectric conversion elements; and

wherein said first high speed mode calculates the distance when the measurement subject is moving at a relatively slow speed and said second high speed mode calculates the distance when the measurement subject is moving at a relatively fast speed.

Claim 20. (Canceled)

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Claim 21. (Currently Amended) A device according to claim ~~20~~ 19, wherein said first distance measuring processor ~~is for measuring~~ measures a stationary measurement subject and said second distance measuring processor ~~is for measuring~~ measures a moving measurement subject.

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Claim 22. (Canceled)

Claim 23 (New) A device according to claim 13, wherein each of the plurality of groups shares at least one of the horizontal lines.

Claim 24 (New) A device according to claim 23, wherein the plurality of groups comprises at least three groups.
